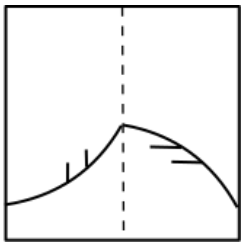
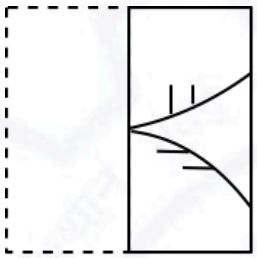
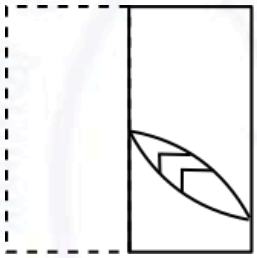
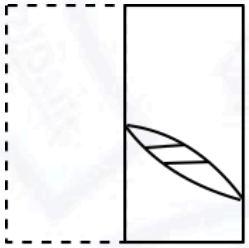
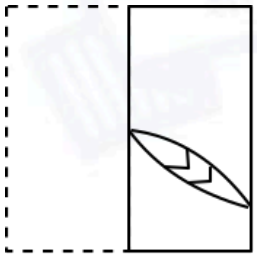
General Aptitude (GA)

Q.1 – Q.5 Multiple Choice Question (MCQ), carry ONE mark each (for each wrong answer: – 1/3).

Q.1	**Gauri said that she can play the keyboard _____ her sister.**
(A)	as well as
(B)	as better as
(C)	as nicest as
(D)	as worse as

Q.2	 **A transparent square sheet shown above is folded along the dotted line. The folded sheet will look like _____.**
(A)	
(B)	
(C)	
(D)	

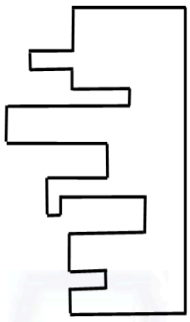
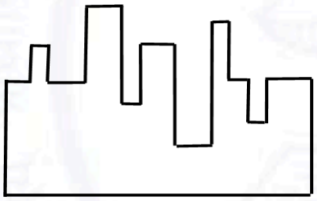
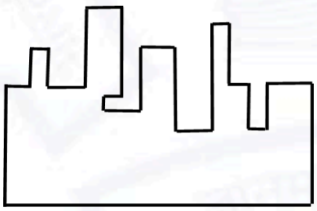
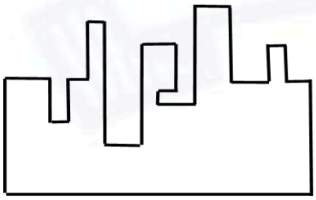
Q.3	If θ is the angle, in degrees, between the longest diagonal of the cube and any one of the edges of the cube, then, cos θ =
(A)	$\frac{1}{2}$
(B)	$\frac{1}{\sqrt{3}}$
(C)	$\frac{1}{\sqrt{2}}$
(D)	$\frac{\sqrt{3}}{2}$

Q.4	If $\left(x-\frac{1}{2}\right)^2-\left(x-\frac{3}{2}\right)^2=x+2$, then the value of x is:
(A)	2
(B)	4
(C)	6
(D)	8

Q.5	Pen : Write :: Knife : _____ Which one of the following options maintains a similar logical relation in the above?
(A)	Vegetables
(B)	Sharp
(C)	Cut
(D)	Blunt

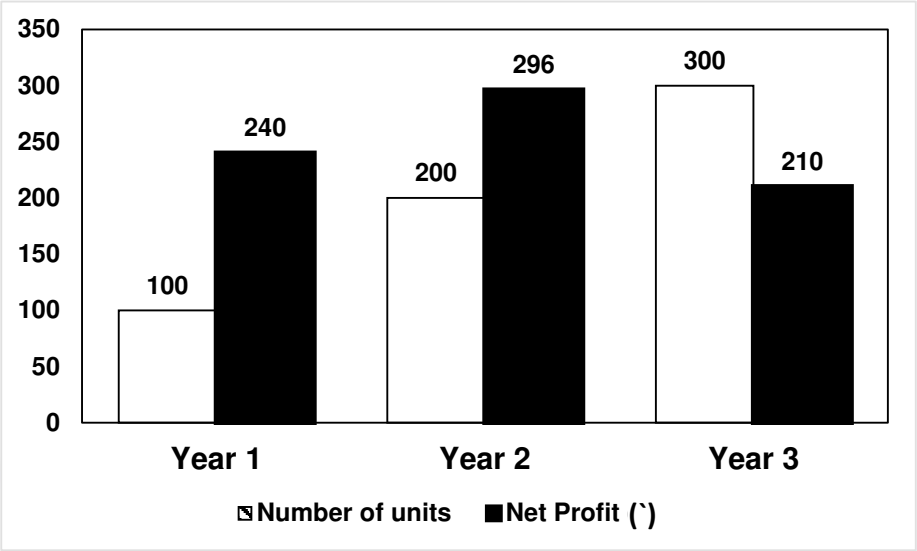
Q. 6 – Q. 10 Multiple Choice Question (MCQ), carry TWO marks each (for each wrong answer: – 2/3).

Q.6	**Listening to music during exercise improves exercise performance and reduces discomfort. Scientists researched whether listening to music while studying can help students learn better and the results were inconclusive. Students who needed external stimulation for studying fared worse while students who did not need any external stimulation benefited from music.** **Which one of the following statements is the CORRECT inference of the above passage?**
(A)	Listening to music has no effect on learning and a positive effect on physical exercise.
(B)	Listening to music has a clear positive effect both on physical exercise and on learning.
(C)	Listening to music has a clear positive effect on physical exercise. Music has a positive effect on learning only in some students.
(D)	Listening to music has a clear positive effect on learning in all students. Music has a positive effect only in some students who exercise.

Q.7	 **A jigsaw puzzle has 2 pieces. One of the pieces is shown above. Which one of the given options for the missing piece when assembled will form a rectangle? The piece can be moved, rotated or flipped to assemble with the above piece.**
(A)	
(B)	
(C)	
(D)	

Q.8	**The number of students in three classes is in the ratio 3:13:6. If 18 students are added to each class, the ratio changes to 15:35:21.** **The total number of students in all the three classes in the beginning was:**
(A)	22
(B)	66
(C)	88
(D)	110

Q.9



The number of units of a product sold in three different years and the respective net profits are presented in the figure above. The cost/unit in Year 3 was ` 1, which was half the cost/unit in Year 2. The cost/unit in Year 3 was one-third of the cost/unit in Year 1. Taxes were paid on the selling price at 10%, 13% and 15% respectively for the three years. Net profit is calculated as the difference between the selling price and the sum of cost and taxes paid in that year.

The ratio of the selling price in Year 2 to the selling price in Year 3 is _____.

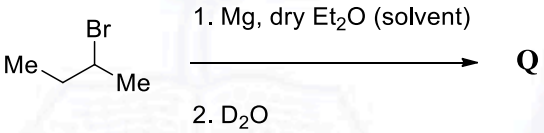
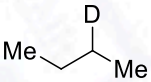
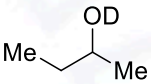
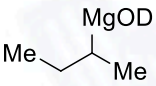
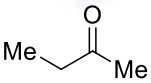
A)	4:3
(B)	1:1
(C)	3:4
(D)	1:2

Q.10	**Six students P, Q, R, S, T and U, with distinct heights, compare their heights and make the following observations.** **Observation I: S is taller than R.** **Observation II: Q is the shortest of all.** **Observation III: U is taller than only one student.** **Observation IV: T is taller than S but is not the tallest.** **The number of students that are taller than R is the same as the number of students shorter than _____.**
(A)	T
(B)	R
(C)	S
(D)	P

Chemistry (XL-P)

Q.1 – Q.2 Multiple Choice Question (MCQ), carry ONE mark each (for each wrong answer: – 1/3).

Q.1	**The geometry of $Fe(CO)_5$ is** **(Given: Atomic number of Fe = 26)**
(A)	pentagonal planar
(B)	square pyramidal
(C)	trigonal bipyramidal
(D)	trigonal pyramidal

Q.2	**The structure of the major product Q of the following reaction is** 
(A)	
(B)	
(C)	
(D)	

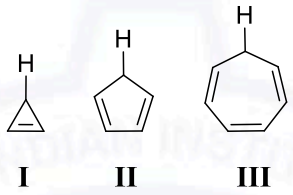
Q.3 – Q.5 Numerical Answer Type (NAT), carry ONE mark each (no negative marks).

Q. 3	**The time taken by a first order reaction to reach 90% completion is 20 s. The time taken for the reaction to reach 50% completion is _____ s (rounded off to the closest integer).**

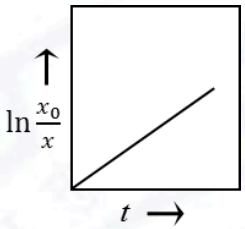
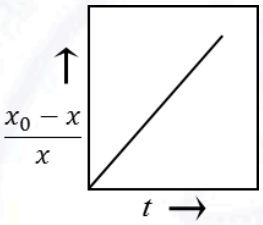
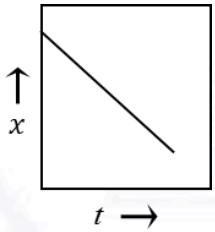
Q. 4	**The ground state energy of an electron in a hydrogen atom is –13.60 eV. The energy of the electron in the third excited state is _____eV (rounded off to two decimal places).**

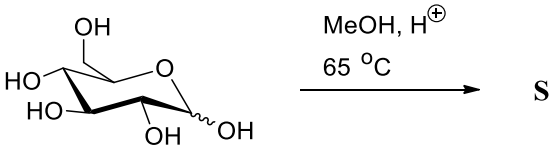
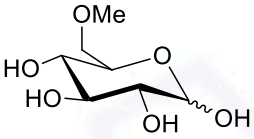
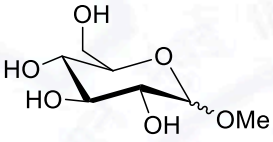
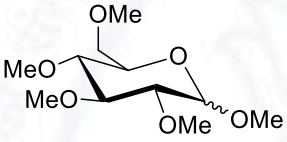
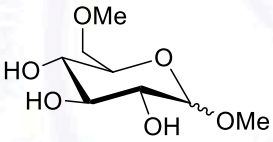
Q.5	**A solution of a compound shows an absorbance of 0.42 at 275 nm in a cuvette with 0.1 dm light path. The molar absorptivity of the compound is $\varepsilon_{275} = 8.4 \times 10^3\ M^{-1}\ cm^{-1}$. The concentration of the compound is _____$\times 10^{-5}$ M (rounded off to the closest integer).**

Q.6 – Q.9 Multiple Choice Question (MCQ), carry TWO mark each (for each wrong answer: – 2/3).

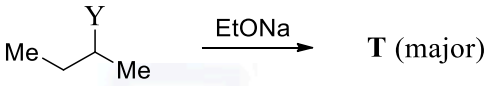
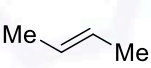
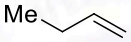
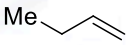
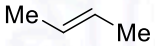
Q. 6	**The CORRECT order of acidity of the following compounds is**  **I** **II** **III**
(A)	**II > I > III**
(B)	**II > III > I**
(C)	**III > II > I**
(D)	**III > I > II**

Q. 7	**The O–O bond order in O_2^{2-} species is**
(A)	0.5
(B)	1.0
(C)	1.5
(D)	2.0

<table>
<tr><td>Q. 8</td><td>For a reaction, X → Products
Group I contains three plots of reactant concentrations as functions of time, where x = concentration of reactant X at time t; x_0 = concentration of reactant X at initial time, t = 0. Group II gives a list of different orders of reaction. Match the plots with the order of the reaction.
Group I Group II
(P)  (1) Zero order
(Q)  (2) First order
(R)  (3) Second order</td></tr>
<tr><td>(A)</td><td>(P) – (1), (Q) – (2), (R) – (3)</td></tr>
<tr><td>(B)</td><td>(P) – (3), (Q) – (2), (R) – (1)</td></tr>
<tr><td>(C)</td><td>(P) – (2), (Q) – (3), (R) – (1)</td></tr>
<tr><td>(D)</td><td>(P) – (2), (Q) – (1), (R) – (3)</td></tr>
</table>

Q. 9	**The structure of the major product S of the following reaction is** 
(A)	
(B)	
(C)	
(D)	

Q.10 – Q.11 Multiple Select Question (MSQ), carry TWO mark each (no negative marks).

Q. 10	**The CORRECT combination(s) of Y and T for the following elimination reaction is(are)** 
(A)	Y = $\overset{\oplus}{N}Me_3$ and **T** = 
(B)	Y = $\overset{\oplus}{N}Me_3$ and **T** = 
(C)	Y = Br and **T** = 
(D)	Y = Br and **T** = 

Q. 11	**Among the following, the diamagnetic species is(are)** **(Given: Atomic numbers of Fe = 26, Co = 27, and Ni = 28)**
(A)	$[CoF_6]^{3-}$
(B)	$[Ni(H_2O)_6]^{2+}$
(C)	$[Fe(CN)_6]^{4-}$
(D)	$[Co(NH_3)_6]^{3+}$

Q.12 – Q.15 Numerical Answer Type (NAT), carry TWO mark each (no negative marks).

Q. 12	**Given the following standard heats of formation, $\Delta_f H^{\ominus}(P, g) = 314.6$ kJ mol^{-1}, $\Delta_f H^{\ominus}(PH_3, g) = 5.4$ kJ mol^{-1}, and $\Delta_f H^{\ominus}(H, g) = 218.0$ kJ mol^{-1}, the average bond enthalpy of a P–H bond in PH_3(g) is _____ kJ mol^{-1} (rounded off to one decimal place).**

Q. 13	**The total number of possible geometrical isomer(s) for $[PtBrCl(NH_3)(py)]^0$ is _____.** **(Given: py = Pyridine and atomic number of Pt = 78)**

Q. 14	**Given the standard reduction potentials, $E^{\ominus}_{Mg^{2+}/Mg} = -2.37$ V and $E^{\ominus}_{Ag^{+}/Ag} = 0.80$ V, the potential of the following cell** $$Ag^{+}(aq., 1\ mM) + Mg(s) \rightleftharpoons Ag(s) + Mg^{2+}(aq., 0.2\ M)$$ **at 25 °C is_____ V (rounded off to two decimal places).** **(Given: Faraday constant = 96500 C mol^{-1}, Gas constant R = 8.314 J K^{-1}mol^{-1})**

Q. 15	**The freezing point of 80 g of acetic acid (freezing point constant 3.9 K kg mol^{-1}) was lowered by 7.8 K due to the addition of 20 g of a compound. The molar mass of the compound is _____ g mol^{-1} (rounded off to closest integer).**

END OF THE QUESTION PAPER